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perhaps one or two other principles, in an organic way, to yield a better metaphysics. Admission of the principle of creative synthesis into one's metaphysics would make relations dependent for their character as external or internal upon the stage of development reached—thus, for example, some at least of the external relations of atoms might become internal relations of molecules into which the atoms were combined. This would not do away with Sheldon's argument, but would place it in a different setting. When several such settings for his dualities have been supplied, it may be that reality will not appear to be so freely and arbitrarily dual as he finds it to be. Freedom may be found to consist in the generation of new things[36] rather than in the quick shifting back and forth between the terms of a duality.[37] All this, however, lies beyond the scope of the present paper. It is mentioned here in order to indicate what seems to us to be the fact that duality, especially as evidenced to us in the implicit duality of thinking, is a metaphysical principle of prime importance, but does not by any means exhaust the content of metaphysics.

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THE t OF PHYSICS

CONSIDER the equation $E = f(x, y, z, t_0)$ when $t_0 = 0$. This represents what may be called a snap shot and is supposed to show the relation of E to a frame of reference x, y, z, at any given instant. But what does $t = 0$ mean? We can no more stop time than we can stop the revolutions of the earth. The time that we live is entirely independent of our manipulation of t. The moment we posit an instant A in time, real time has already flowed on past A.

Let us consider the room in which we exist as our frame of reference x, y, z. Our position in this room can be defined by certain lengths L_1, L_2, L_3, relative to this frame of reference. Inasmuch as we and the room move with the earth through space, our frame of reference has a motion of course relative to some other frame of reference away from the earth, but we ignore this motion because it can not affect our actions and say we are at rest in the room, meaning thereby only that there is no relative motion between us and the room which constitutes our frame of reference.

We define our position at rest by giving certain values to

[36] *Cf. ibid.*, p. 500.

[37] *Strife of Systems*, pp. 474–476.

L_1, L_2, L_3, relative to the room. Now suppose we move about in the room. This is a common real experience which we can get voluntarily, *i.e.*, we can control our motion in the room. But mathematically this means that we can alter, as we please, the values of L_1, L_2, L_3, up to the limits of the room. We can move along the axis OX and then we can move back again to the point of departure and produce the original values of L_1, L_2, L_3. This is a real fact in experience and so the mathematical handling of L_1, L_2, L_3, does represent something real in experience.

Now in mathematical physics t is treated just as we treat L; that is, it is increased, decreased or made equal to zero. But the important point to note, the basis of the philosophical error in mathematical physics, is that this method of handling t does not correspond to anything real in experience. It took time to move along OX. When we retrace our steps in space it takes still more time; we can not reverse time. When we moved back along OX we decreased L, but surely we did not decrease time. In experience we actually can do something which is properly represented by saying L is decreasing to zero, but we can never do anything which will allow us to say the same thing of time. The only thing we can say of time is that it is always increasing and is entirely independent of our action. This is a very important point. In mathematical physics t is treated just as L is treated, but whereas our mathematical treatment of L means something in experience, the same treatment of t has no meaning at all in experience. The t of physics is not real time at all.

A similar misunderstanding arises with regard to our mathematical treatment of motion. We say for instance we are going to describe a motion from A to B. But if the motion is from A to B either, (1) it has stopped at B, or (2) it has gone beyond B. In the first case the motion has ceased and so all we can describe is what is left behind in existence by the motion, namely the space passed over by the motion. In the second case nothing we can say about AB can relate to the motion because by the hypothesis the motion is not there but somewhere else, namely beyond B. What we describe in every case is space and not motion. If we attempt to treat motion mathematically, that is quantitatively, if we cut it up into parts, we really substitute for the original motion a series of motions plus a series of rests, which is not the same thing at all as can be shown easily as follows. If we move across the room without stopping we get a certain experience. If we move across the room in steps of three feet stopping between steps we get an experience wholly different qualitatively. This must be so, other-

wise we could not tell what we were doing. But if we add the spaces passed over by the steps the sum will just equal the space passed over originally, *i.e.*, mathematical treatment applies only to space, never to motion.

Consider another case. If we ask you to describe a picture but move it about very rapidly, you will say immediately: "Hold it still. How can I describe it if you keep moving it about?" Just so, how can you? But do you not see that a still time ($t=O$) is not real time at all?

The trouble is due to the fact that in experience we get a percept of real time due to memory and on this as a basis we create an artificial concept of time which we know as the t of physics. It is inevitable that in practise we treat this symbol t quantitatively just as we do L. This does not mean that we hold t to be actually the same space as is represented by L, but it does mean that the only possible way mathematics can treat anything is the way it treats L, that is quantitatively, and to this way we apply the term "spatial."

The t of physics is the fourth dimension of experience lived as real time, but treated mathematically as if it were space. This is only to put into a short sentence the idea that Prof. Bergson has elucidated so clearly, so thoroughly, and so beautifully in his book *Time and Free Will.*

Now in physics we can give this t any values we please and handle it as we handle L in mathematics, but we must always remember that this t, while created originally from our direct experience with real time, is subsequently handled in a way that has no relation to real time at all since real time can not be increased or decreased by us nor can it equal zero. These characteristics apply only to space. Now there is no fault to be found at all in setting up a symbol t to represent a concept based upon our percept of real time. We have to do it, otherwise we could have no mathematical physics; only we must be very careful in drawing conclusions from equations in which t exists regarding our experience in real time.

All description is made upon the assumption that $t=O$ while we describe, and hence physics ignores real time, which, of course, never equals zero. Philosophically it is the idea of the absence of change during the description that is represented in physics by t_0; t_0 means that we are going to describe something at one instant of time, but manifestly this is impossible since any description requires more than one instant of time to make it. Why then does physics work? It works because the moment we act upon any of

its description we necessarily have to bring back into the phenomenon the real time which is missing in the description, since we live in real time and not in the t of physics.

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THE PARIS PHILOSOPHICAL CONGRESS

IT was the writer's great pleasure to attend the joint meeting of members and friends of the French, British, Belgian, Italian and American Philosophical Associations which was organized by the French Association and held in Paris in the holiday week of 1921.

The meeting began on the forenoon of December 27, with an address of welcome by Monsieur Xavier Léon, president of the French Association. Professor Brunschvicg pronounced a very simple and very eloquent testimonial in honor of the French colleagues who had died during the past seven or eight years. In the afternoon came a general session for the section of psychology and metaphysics at which Professor Bergson presided. Mr. Wildon Carr made a very interesting and persuasive distinction between the old idealism of Berkeley and the German tradition, and the new idealism represented by Croce and Gentile, but most adequately by Gentile. After an interval of discussion, Mr. Carr was followed by Professor Schiller, who argued that every fact is an instance of value, and that science can not, therefore, ever be dehumanized. Mr. Carr and Mr. Schiller spoke in English, and Professor Bergson summarized their theses in French.

At six that afternoon there was a reception to the foreign delegates at the Rapprochement Universitaire, rooms that correspond a little to an American faculty club.

Next day, December 28, began the meetings of the four special sections: logic and the philosophy of science, psychology and metaphysics, history of philosophy, ethics and sociology. These meetings were held in different rooms so that one hearer could not possibly listen to more than a few of the papers presented. I was assigned to the section for the history of philosophy and thus heard the interesting and very learned paper of Monsieur Dapréel from Brussels on *Socratisme et Platonisme*—one of the themes proposed by the French Association. Professor Dapréel's conclusions and evidence were to be published in book form by the end of 1921. There was an active discussion, by Monsieur Robin, professor of ancient philosophy at the Sorbonne, and Monsieur Croiset, who presided.